to the memories of our readers—and in doing so we shall dwell more particularly on such as, through recent discoveries or controversies, have acquired especial interest at the present day.

Every explorer who, since the publication of the "Observations on Volcanic Islands," has been called upon to investigate districts containing extinct volcanos, has been greatly aided by the valuable store of facts and suggestions contained in that work. We very much doubt, however, whether some of the interesting questions discussed in it—and we more especially refer to those relating to the nature and origin of the banded structure in lavas, with the light which these are calculated to throw on the difficult problem of the cause of foliation in rocks—have received that amount of attention from geologists, of which they are certainly deserving.

The proofs of the long-continued elevation of the shores of South America for thousands of miles, and to the height of many hundreds of feet, yet unattended with marked disturbances of the strata, the gradual disappearance of every trace of organism in rocks which once abounded with them, the survival of a most remarkable fauna of gigantic vertebrates to post-tertiary times, and its seemingly sudden extinction at a very recent period—these are some among the many interesting facts described in the second part of the work which are of especial value to geologists seeking to interpret the records of the past. Mr. Darwin's observation of an admixture of Jurassic and Cretaceous types of life in the same deposits in South America have acquired fresh significance now that the United States geologists have shown that ammonites range up into the tertiary strata, and that Dr. Waagen has described ammonites, goniatites, and ceratites, occurring in India, in the same bed with several carboniferous species of brachiopods. Now, too, that so much has been done by Dana, Le Conte, and others, in determining the mode of origin of the Rocky Mountains, and the part played by the volcanic outbursts which occurred simultaneously with the mountain-forming movements, Mr. Darwin's clear descriptions of the sections noticed by him in his traverses of the chain of the Andes will be referred to with fresh interest by geologists: and the comparison of phenomena displayed in distant parts of the same great chain is highly suggestive. But space fails us to refer to even a tithe of the points of interest which we have noted in our reperusal of this valuable work.

A striking characteristic of all Mr. Darwin's writings, and one which is very eminently displayed in the work before us, is his scientific candour. Like his teacher and friend, the late Sir Charles Lyell, he never forgets in his discussions to look at all sides of the questions before him, and to give the fullest expression and weight, alike to the difficulties which he himself detects, and to arguments which opponents may have advanced. With superficial readers this peculiarity in the writings of Lyell and Darwin has apparently very unjustly detracted from their merits; and we are sometimes amused by finding critics boldly parading as their own, objections which it is perfectly clear that only the candour of the authors has permitted them to rehearse, but which their own knowledge has not sufficed to enable them to understand or to make adequate use of.

Perhaps at no period in the history of the science have the great facts of geology suffered so much distortion from the works of pseudo-scientific writers—through which media alone science is too often, alas! transmitted to the general public—than at present. These writers selecting a few isolated and imperfectly understood facts, in bold defiance or lamentable ignorance of a thousand unmistakable and clearly established principles, proceed to build up the most elaborate hypotheses. We cannot therefore help regarding the republication of Mr. Darwin's "Geological Observations" as a most opportune event. The able geologist, De la Beche, many years ago wrote a charming little book entitled "How to Observe in Geology." To those anxious to learn this most important art at the present time, we would recommend as a model—since example is better than precept—the work now before us. The careful study of the clear and minute descriptions of geological phenomena, and the following step by step of the fair and cautious discussion of facts and arguments contained in this book can scarcely fail indeed to teach the reader something which is even more valuable than "how to observe," namely, how to *reason* in geology.

JOHN W. JUDD

TWO "CHALLENGER" BOOKS

Log Letters from the "Challenger." By Lord George Campbell. (London: Macmillan and Co., 1876.)

The Cruise of Her Majesty's Ship "Challenger." By W. J. J. Spry, R.N. With Map and Illustrations. (London: Sampson Low and Co., 1876.)

IT was to be expected that with so carefully-selected and intelligent a staff, both naval and civilian, on board, the cruise of the *Challenger* would be productive of something more than the official literature. It will have been seen from the "Preamble" which we recently published (*antea*, p. 254) that it must necessarily take a long time to arrange the abundant scientific results that have been obtained, and the complete official accounts may not be in the hands of the public for years. The Report on the Austrian *Novara* Expedition has taken seventeen years' serious labour to complete; but we hope to be in possession of the *Challenger* Reports in a much less space of time. Meantime many readers will be glad to have in a handy form a general account of the work which the expedition has done, and some details concerning the incidents of the long cruise and the many places which the ship visited. From either of the books before us such information may be obtained.

There is a wide difference, however, between the characters of the two works. Lord Campbell's is by no means an attractive book at first sight. It is a big, plain, heavy-looking volume, with a large page well filled with type, enormous paragraphs of sometimes half-a-dozen pages in length, and with not a single picture. One is apt to sigh at first at being compelled to read it, but after perusing a few sentences the reader "puts on the garment of praise for the spirit of heaviness," and finds the real difficulty to be to stop. Lord Campbell's pages bear all the marks of being genuine letters, written with no thought of a public before him, and only for the entertainment of those to whom they were sent. He has evidently not "got up" his subject at all, the information he conveys being almost

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entirely the results of his own observation. And a thoroughly good and most original observer he is, with a faculty of telling what he has seen in such a way as keeps the reader in a constant state of exhilaration. Lord Campbell makes no pretence at instruction, nevertheless in his own characteristic and irresistibly amusing way, he conveys a vast amount of information concerning all the places visited by the *Challenger*, and tells not a little of the results of the soundings and dredgings carried out by the "scientifics," as he calls the civilian staff. But apart from the genuine entertainment to be had from the work, its great value will be the observations made by the author on the various peoples among whom he sojourned for a longer or shorter period. Even well-informed ethnologists, we should think, will be able to obtain not a little important information from the work on the present condition, for example, of the inhabitants of many of the Pacific islands, such as those of the Friendly, Fiji, and Sandwich Islands, New Guinea, Admiralty Islands, &c. A very large space is devoted to Japan, and many shrewd remarks made on the present condition and future prospects of the Japanese. There are many interesting notes besides, on the physical aspect and natural history of most of the places visited, and in almost all cases it will be found that some new feature has been brought out. Even of such well-worn subjects as Teneriffe, the Azores, Cape de Verde Islands, Australia, New Zealand, Tahiti, the South American littoral, Lord Campbell manages to say something unexpectedly original. In a concluding chapter he gives an instructive summary of the *Challenger's* work and how she did it. We can only, in our space, speak in the most general way of the nature of the contents of this work. A more entertaining, a more genuinely bracing book, it would be difficult to find, and the reader who goes carefully to the end of it will have added considerably to his knowledge of the earth's surface. It is a great pity that a work so full of varied information should have been published without either an analytical table of contents or an index. A map would also have been a great help to the reader.

Mr. Spry professes simply to give a plain, straightforward narrative of the cruise, of some of the chief results obtained by sounding and dredging, with notes on the places and people visited, partly the result of his own observation and partly of reading. The book is nicely got-up, well printed, and contains a large number of interesting and well-executed illustrations, not only of people and places, but of the implements used in carrying out the work of the *Challenger*. He gives a very clear account of the various apparatus used, their construction and uses, which we commend to the perusal of the uninitiated reader who wants to know how such work as that of the *Challenger* is performed. Mr. Spry gives the curious story of the brothers Stoltenhoff, who were found living alone on Inaccessible Island, at considerable length, in the words of the elder brother. The work contains a really large amount of valuable information, and as no two men observe alike, we commend those who desire to have complete information about the cruise of the *Challenger*, to read both books. While Mr. Spry sometimes unnecessarily introduces information obtained from books, his work is, on the whole, thoroughly readable, and certainly instructive. Altogether, these preliminary "snacks" augur well for the great official feast which is being prepared for us.

OUR BOOK SHELF

The Year-Book of Facts in Science and Arts for 1876. Edited by James Mason. (London: Ward, Lock, and Tyler, 1877.)

THE "Year-Book of Facts" so long associated with the name of the late indefatigable Mr. Timbs seems to have taken a new lease of life under the present editor, who begins his duties with the volume before us. Some useful changes have been made; thus, there is a marked improvement in the arrangement and character of the contents, and the period covered by this year-book now extends from the autumn of one year to the autumn of the following, and not January to December as heretofore. The longer time thus given for preparation has been well used by Mr. Mason, who certainly has produced a volume far in advance of any of its predecessors. It is hardly necessary for us to say much about this well-known year-book, which does not pretend to be more than a popular digest of scientific scraps; and in no sense supplies the need, to which we have alluded in previous notices, of a carefully-prepared record of scientific progress—the nearest approach to which in the English language is the American "Annual Record of Science and Industry," edited by Mr. Baird. The present editor of the book before us has done his work, so far as it goes, in a comprehensive and careful manner. One or two serious omissions we notice, notably the important discovery made by Dr. Ker, and announced at the last meeting of the British Association, of the rotation of the plane of polarisation by reflection from a polished magnetic pole, certainly one of the most novel physical facts of the past year.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

Just Intonation

YOUR esteemed correspondent, Col. A. R. Clarke, declines to admit any error or oversight in his communication to NATURE under the signature of "A. R. C.," on December 21, 1876. I regret to be of a different opinion. The first error which I pointed out ought to be palpable enough to a mathematician who is acquainted with the ratios of a scale, and therefore I treated it as an oversight. Col. Clarke gives 27 to 16, instead of 5 to 3, as the ratio for A in our present diatonic scale. By his enlargement of the interval he would unknowingly convert the well-known consonance of a major Third between F and A into a Pythagorean ditone. Evidently the Colonel is not aware that F and A are notes *interposed* in the scale of C, that harmonically they belong to F, and require F as a consonant bass. All this has been explained in a pamphlet in print. I would therefore suggest to Col. Clarke an investment of sixpence in the purchase of a "Review of Helmholtz's New Musical Theories," published by Novello, Ewer, and Co., No. 1, Berners Street. To prove all the unadmitted charges would be too long for NATURE, and Col. Clarke will find most of them touched upon in that pamphlet as well as other current errors. In the meantime it is not difficult to tell that Col. Clarke derived his ratio from the harmonic scale of C, and not from that of F (which would have been right), or from the work of any modern mathematician.

It is because F and A are harmonically derived from F that our scale cannot be reduced to a common denominator. The F string exceeds the length of the C string by half, the ratio being 3 to 2, and one of the first rules of proportion is that

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